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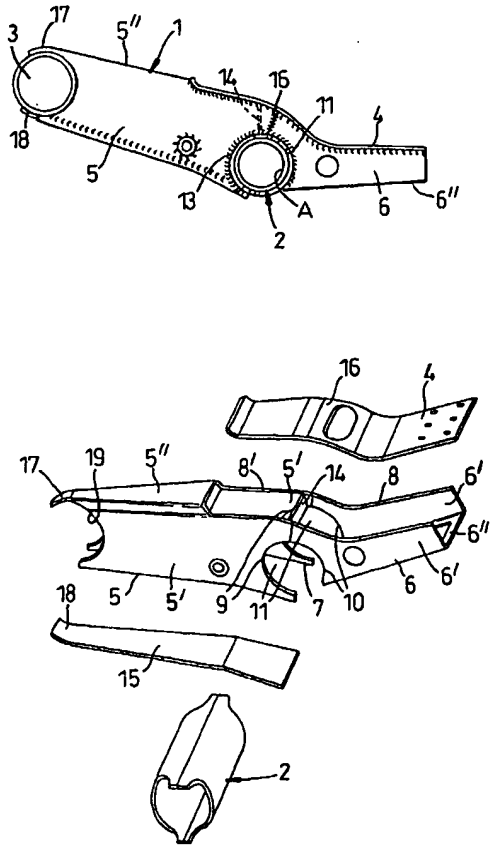
(54) Title: VEHICLE SUSPENSION BEAM




(57) Abstract: A hollow vehicle suspension beam (1) has opposed side walls formed with recesses (11) in which an axle wrap (2) is located and secured by welded jointing (12, 13) internally and externally of the opposed side walls to provide a strong joint between the beam and axle wrap. The beam may comprise at least one component (5, 6) of a generally U-shaped section the opposed limbs of which provide at least part of the opposed side walls of the beam, and the mouth of the section provides an access opening into the interior of the beam for the internal welded jointing (12) to be made at the axle wrap. One embodiment has the beam comprised of two of the U-shaped components (5, 6) disposed with their mouths opening in opposite directions to provide access to the interior of the beam for the internal welded jointing to be made at the axle wrap (2) before the mouths are closed by closure components (15, 16). Another embodiment has the opposed side walls formed in combination by the opposed limbs of a U-shaped component and the space between the plate components being closed off by closure components after the internal welded joint have been made.

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# Vehicle Suspension Beam

This invention relates to a vehicle suspension beam of the kind which is pivoted at one end to a support for use, carries spring means at or towards its opposite end and has an axle connected to it at an intermediate part of its length.

Suspension beams are known which are of a box-section fabricated from metal plate. Such a beam has an axle wrap, by which the axle is retained to the beam, secured transversely of its length in complementary recesses formed in the beam. The axle wrap is secured to the beam by welded or adhesive jointing at the exterior of the beam. A problem experienced with this known form of suspension beam is that the welded jointing becomes weakened by metal fatigue and can fail under loading to which the axle and beam are subjected in use.

The present invention is aimed at providing a vehicle suspension beam which has a stronger joint between the beam and an axle wrap.

According to the present invention a vehicle suspension beam is provided which is hollow and has opposed side walls formed with recesses in which an axle wrap is located and secured to the beam by welded jointing internally and externally of said side walls.

At least adjacent to the recesses the beam may be constructed so as to provide an access opening or openings for access into the interior of the beam for the welded jointing to be made between the axle wrap and the opposed side walls. The access opening or openings may be closed subsequently. The beam may, for example, have the or each access opening between the side walls. The beam may comprise at least one component of a generally U-shaped section of which the opposed limbs

provide at least parts of the side walls and the mouth provides an access opening to the interior of the beam. A closure component may be secured to the U-shaped component to close the mouth when the welded jointing has been made internally of the side walls. There may be such a U-shaped component which extends substantially to one side of the axle wrap to provide part of the side walls of the beam, and laterally spaced plate components extending substantially to an opposite side of the axle wrap which provide further parts of the side walls of the beam. Access to the interior of the beam for the welded jointing internally of the side walls may be made by way of the mouth of the U-shaped component and by way of the space between the plate components. The mouth and said space may be closed off subsequently by closure components fixed, for example by welding, to the U-shaped component and the plate components. In another construction the beam, at least adjacent to the recesses, may have components of a generally U-shaped section mouths of which provide access openings which open in opposite directions transversely of the beam and provide access to the interior of the beam for the welded jointing of the axle wrap to the side walls at the interior of the beam to be made. In whichever manner an access opening or openings may be provided it is preferably possible for a continuous welded joint to be made around the circumference of the axle wrap contained inside the beam.

In one embodiment the beam comprises two elongate components of a generally U-shaped section connected end-to-end such that the mouth of the U-shaped section of one component is oppositely directed to that of the other component. The opposed limbs of the U-shaped sections of the components form side walls of the beam. The recesses for the axle wrap are formed in at least one of the components at or adjacent to the end-to-end connection. Access is provided through the mouths of the components for the welded jointing of the axle wrap to the side walls of

the beam at the interior of the beam. The mouths are subsequently closed by closure plates. In another embodiment the beam comprises one such elongate component of a generally U-shaped section and two laterally spaced side plate components which are connected end-to-end with, as continuations of, the opposed limbs of the U-shaped component. The opposed limbs of the U-shaped component and the side plate components form side walls of the beam. The recesses for the axle wrap are formed in the U-shaped component and/or the side plate components at or adjacent to the connection of the side plate components to the limbs of the U-shaped component. Cover plates are secured over the mouth of the U-shaped component and between the side plate components when the welded jointing at the interior of the beam has been made, so as to close off the interior of the beam. The finished beam has a closed box-section. A cover plate which closes the mouth of the U-shaped component may also extend over and be secured to adjacent longitudinal edges of the side plate components.

The axle wrap may be secured to the beam such that part of its length is fully contained inside the beam. Alternatively, for part of its length, a portion of the circumference of the axle wrap may be contained inside the beam and the remainder of the circumference at that part of the length of the axle wrap may be exposed outside the beam. The recesses in the beam are formed accordingly.

In the embodiments described the recesses are partially formed in the components at the ends of the components at which they are connected together.

A shear plate or plates may be secured across the interior of the beam for increased transverse rigidity of the beam's section, if required.

A suspension beam in accordance with the present invention has a substantially stronger connection between the beam and axle wrap as a result of the internal and external welded jointing at the side walls of the beam, than has been possible with the known suspension beams which have only external welding jointing at the beam to the axle wrap. The internal and external welded jointing eliminates the failure-promoting relative bending which has occurred at the root of the conventional, external only, welded joint between the beam and axle wrap under loading on the suspension beam when in use. Loading is concentrated instead on the parent material of the structure of the beam.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

**Figure 1** is a plan view of a suspension beam in accordance with the present invention,

**Figure 2** is a side view of the suspension beam,

**Figure 3** is an exploded perspective view of the suspension beam, and

**Figure 4** is an enlarged detailed section through the suspension beam.

The suspension beam of this embodiment is provided for a trailing arm suspension of a trailer vehicle.

The suspension beam comprises a beam proper 1 and an axle wrap 2 secured transversely to the beam 1 at an intermediate part of the length of the beam. In use, as shown in Figure 2, a pivot bush 3 is secured to a

front end of the beam 1, an air spring, not shown, is mounted on a seating 4 provided on the rearward end part of the beam, and the axle wrap 2 is secured on an axle A.

As best seen in Figure 3, the beam 1 comprises two elongate, forward and rearward, components 5, 6 which are each of a generally U-shaped section and are butt-welded end-to-end. Each component 5, 6 is made from metal plate cut to the required outline and formed to the generally U-shaped section. Opposed side limbs 5' 6' and the web 5" 6" of the section of each of the two components 5, 6 are straight and meet at right angles to form three sides of a box-section. The side limbs 5' of the forward component converge towards the front end of the beam, whereas the side limbs 6' of the rearward component run substantially in parallel to the rear end of the beam. At their butting ends the two components are welded together at their side limbs 5', 6' which form side walls of the beam. They are welded such that the web 5" of the forward component 5 is at the top of the beam and the web 6" of the rearward component 6 is at the bottom of the beam. Mouths 7, 8 of the U-shaped sections of the forward and rearward components are thus respectively at the bottom and the top of the beam, and provide access into the interior of the beam at the two components. Part of the web 5" of the forward component is cut away adjacent to the rearward component to provide an extension 8' of the mouth 8 of the rearward component into the forward component.

Side limbs 5' of the forward component 5 taper gradually towards the front of the beam. The side limbs 6' of the rearward component 6 are of similar height to those of the forward component at the butting ends of the components but then taper to approximately half that height and continue at the reduced height, with a gradual taper, for the greater part of the length of the component extending to the rear of the beam.

Part-circular hollows 9, 10 are formed in the edges of the side limbs 5', 6' at the butting ends of the two components 5, 6. With the components welded together, the hollows 9, 10 in their aligned side limbs register to define together an almost circular recess 11 at each side of the beam. The two recesses 11 are co-axial and of a complementary diameter to receive the axle wrap 2 as a close fit. The hollows 9 in end edges of the side limbs 5' of the forward component are adjacent to the mouth 7 of the section of that component, and the hollows 10 in the end edges of the side limbs 6' of the rearward component are adjacent to the web 6" of the section of the rearward component. The two recesses 11 open for a short arcuate distance, of less than one quarter of their circumferences, through the bottom of the beam.

The axle wrap 2, which is tubular and formed from two similar semi-cylindrical metal shells welded together, is located in the co-axial recesses 11 and projects from each side of the beam, Figure 1. It is secured to the beam at the side limbs of the forward and rearward components by continuous welding 12, 13 around the edges of the hollows 9, 10 on the inside, Figure 4, and the outside surfaces, Figure 2, of the side limbs. Access for the welding to be done at the inside surfaces is gained through the mouths 7, 8 of the U-shaped sections of the two components. The mouths allow sufficient access for continuous welding to be done all around the perimeter of each recess at the inside surfaces of the respective side limbs.

The axle wrap may also be welded to the adjacent edge of the web 6" of the rearward component 6.

A stiffening shear plate 14 is secured across the interior of the beam in the forward component 5 above and generally radial to the axle wrap.

The shear plate extends between and is welded to the side limbs 5' of the forward component.

Once the axle wrap 2 and shear plate14 have been welded in place a forward cover plate 15 is welded in the mouth 7 of the forward component to close the bottom of the beam between its front end and the axle wrap. The cover plate 15 may be welded to the axle wrap as well. A rearward cover plate 16 is welded over the mouth 8 of the rearward component and the extension 8' in the forward component to close the top of the beam between its rear end and the web 5" of the forward component. This further cover plate 16 provides the seating 4 on the beam for the air spring.

Front ends 17, 18 of the web 5" of the forward component and of the forward cover plate 15 and front edges of the side limbs 5' of the component are so shaped as to form in combination a seating 19 to hold the pivot bush 3.

# CLAIMS

1. A vehicle suspension beam which is hollow and characterised in that it has opposed side walls formed with recesses (11) in which an axle wrap (2) is located and secured to the beam (1) by welded jointing (12, 13) internally and externally of said side walls.

2. A vehicle suspension beam according to claim 1 characterised in that at least adjacent to the recesses (11) the beam (1) is constructed so as to provide an access opening or openings (7, 8) for access into the interior of the beam for the internal welded jointing (12) to be made between the axle wrap and the opposed side walls.

3. A vehicle suspension beam according to claim 2 characterised in that the or each access opening (7, 8) is closed after the internal welded jointing (12) has been made.

4. A vehicle suspension beam according to claim 2 or claim 3 characterised in that the beam (1) has the or each access opening (7, 8) between the opposed side walls.

5. A vehicle suspension beam according to claim 4 characterised in that the beam (1) comprises at least one component (5, 6) of a generally U-shaped section of which the opposed limbs (5',6') provide at least parts of the opposed side walls and the mouth (7, 8) provides an access opening to the interior of the beam.

6. A vehicle suspension beam according to claim 5 as dependent from claim 3 characterised in that a closure component (15, 16) is secured to the U-shaped component (5, 6) to close the mouth (7, 8) when the internal welded jointing (12) has been made at the opposed side walls.

7. A vehicle suspension beam according to claim 5 or claim 6 characterised in that the U-shaped component extends substantially to one side of the axle wrap (2) to provide part of the opposed side walls of the beam, and laterally spaced plate components extend substantially to an opposite side of the axle wrap to provide further parts of the opposed side walls of the beam, access to the interior of the beam for the internal welded jointing at the opposed side walls being made by way of the mouth of the U-shaped component and by way of the space between the plate components.

8. A vehicle suspension beam according to claim 7 as dependent from claim 6 characterised in that the space between the plate components is closed off after the internal welded jointing (12) has been made at the opposed side walls by closure components fixed to the plate components.

9. A vehicle suspension beam according to claim 5 or claim 6 characterised in that at least adjacent to the recesses (11) the beam (1) comprises two of the components (5, 6) of generally U-shaped section mouths (7, 8) of which provide access openings opening in opposite directions transversely of the beam to provide access to the interior of the beam for the internal welded jointing (12) of the axle wrap (2) to the opposed side walls of the beam to be made.

10. A vehicle suspension beam according to any preceding claim characterised in that the internal welded jointing at the opposed side walls is continuous around the circumference of the axle wrap (2).

11. A vehicle suspension beam according to any preceding claim characterised in that the axle wrap (2) is secured to the beam (1) such that part of its length is fully contained inside the beam.

12. A vehicle suspension beam according to any of claims 1 to 10 characterised in that for part of its length a portion of the circumference of the axle wrap (2) is contained inside the beam (1) and the remainder of the circumference at that part of the length of the axle wrap is exposed outside the beam.

13. A vehicle suspension beam according to any preceding claim characterised in that one or more shear plates (14) are secured across the interior of the beam (1) to provide increased transverse rigidity of the beam's section.

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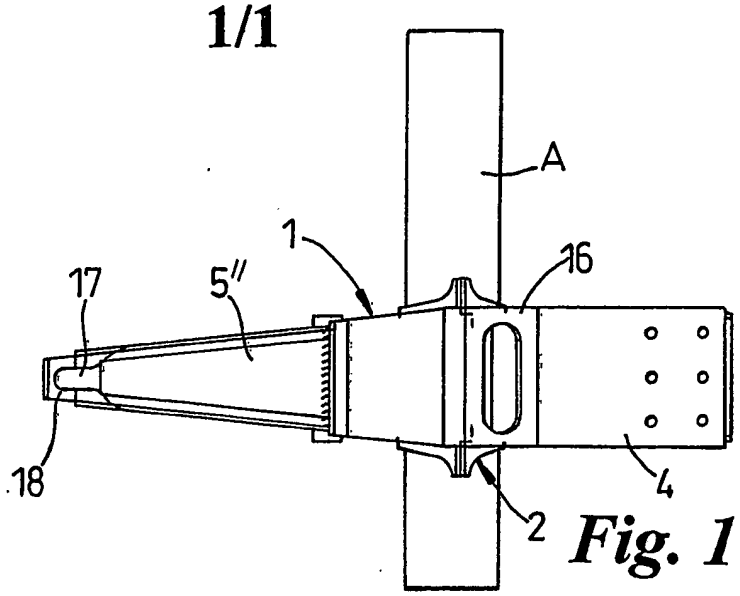



Fig. 1

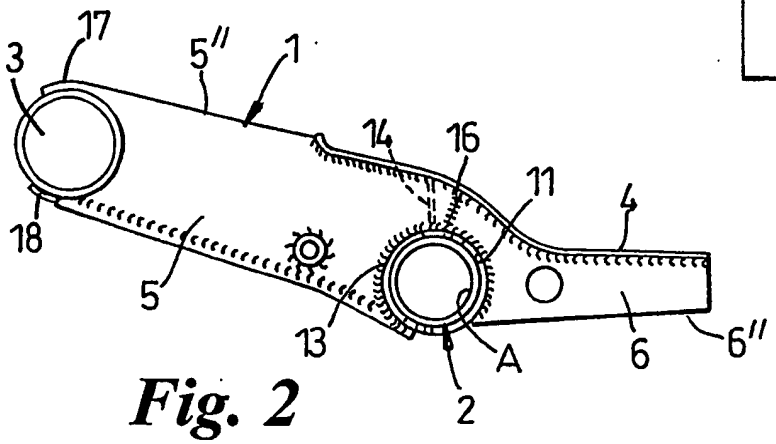



Fig. 2

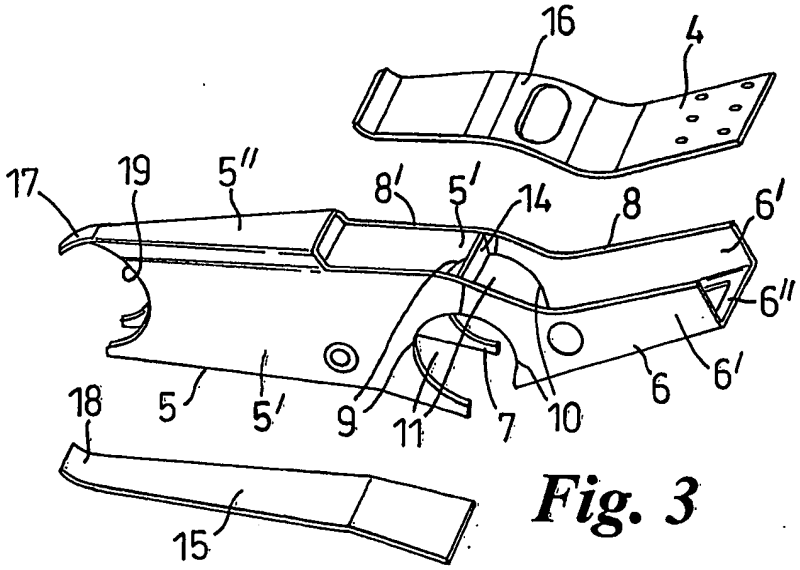



Fig. 3

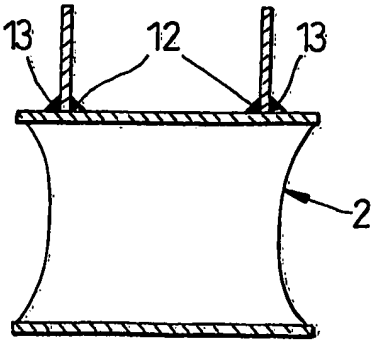
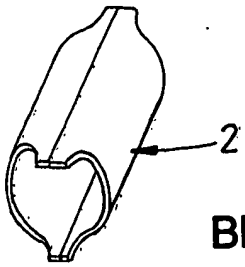



Fig. 4



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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60G7/00 B60G9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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